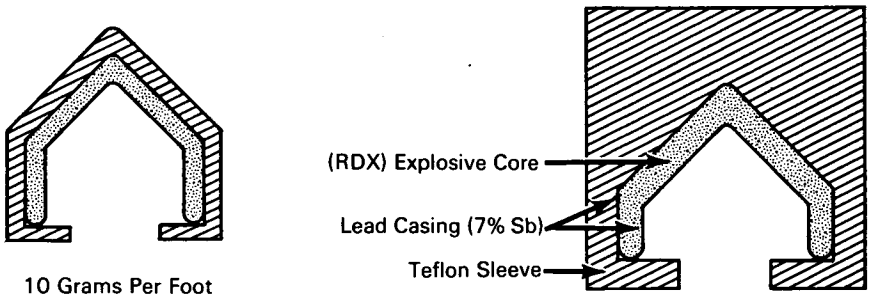
NASA TECH BRIEF

Study Made of Explosive Cutting in Simulated Space Environments



CONFIGURATIONS OF FLEXIBLE LINEAR SHAPED CHARGE (FLSC)

A study was made to determine the feasibility of explosive cutting and to establish techniques applicable to in-space cutting operations. The tests performed were divided into two phases: (1) feasibility tests using various explosives to determine the explosive cutting techniques for cutting a manhole in an empty fuel tank and, (2) technique refinement tests to improve the cutting by using shaped charge cutting techniques.

Complete details of the study are contained in NASA Technical Memorandum, "Explosive Cutting of a Manhole in Simulated Saturn V Upper Stage Fuel Tanks in Space Environments," NASA TM X-53440, by L. O. Hamilton, April 20, 1966.

The results of the study are summarized as follows:

A Flexible Linear Shaped Charge (FLSC) containing 15 grains of RDX per foot and backed by a holding fixture (backup plate) was successfully used to cut 1/8-inch thick 2014-T aluminum. Although data were insufficient to assign a reliability figure, vendor data indicated that a lead encased FLSC containing 15 grains of RDX per foot will cut 1/8-inch thick 6061-T6 aluminum at a reliability of 0.99999 at 90 percent confidence level, at optimum standoff distance.

Testing was conducted at atmospheric pressures and in a vacuum of 26 inches of mercury. There was no degradation of the explosive noted under vacuum conditions.

Microhardness testing of a target, after the cutting operation, indicated that work hardening of the target material is limited to the immediate vicinity of the cut edge.

Note:

Copies of the technical memorandum are available from:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10040

(continued overleaf)

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: L. O. Hamilton and E. R. Coleman
of Hayes International Corporation
under contract to
Marshall Space Flight Center
(M-FS-1597)